

AMENDMENTS TO THE CLAIMS

1. (Currently amended) A fine particle producing apparatus comprising:

a metal holder ~~(30)~~ for housing a powdery or elongate body of metal therein;

a tube ~~(32)~~ mounted on said metal holder ~~(30)~~ for supplying a gas to said body of metal through a porous member ~~(28a)~~;

a gas flow rate controller ~~(34)~~ for controlling a rate at which said gas is supplied to said tube ~~(32)~~; and

a gas heating controller ~~(36)~~ connected to said tube ~~(32)~~ for heating said gas supplied to said body of metal to a predetermined temperature thereby to generate fine metal particles from said body of metal.

2. (Currently amended) A fine particle producing apparatus according to claim 1, wherein said metal holder ~~(30)~~ is detachably mounted on a casting mold ~~(38)~~ and held in communication with a cavity ~~(40)~~ defined in said casting mold ~~(38)~~ for supplying said fine metal particles into said cavity ~~(40)~~.

3. (Currently amended) A fine particle producing apparatus according to claim 2, wherein said metal holder ~~(30)~~ is substantially in the form of a box, further comprising:

a cartridge ~~(46)~~ carrying said body of metal sealed therein

and replaceably housed in said metal holder ~~(30)~~.

4. (Currently amended) A fine particle producing apparatus comprising:

a metal holder ~~(30)~~ for housing a powdery or elongate body ~~(26)~~ of magnesium therein;

a tube ~~(32)~~ mounted on said metal holder ~~(30)~~ for supplying an inactive gas to said body ~~(26)~~ of magnesium through a porous member ~~(28a)~~;

a gas flow rate controller ~~(34)~~ for controlling a rate at which said inactive gas is supplied to said tube ~~(32)~~;

a gas heating controller ~~(36)~~ connected to said tube ~~(32)~~ for heating said inactive gas supplied to said body ~~(26)~~ of magnesium to a predetermined temperature to produce at least a magnesium gas or fine particles of magnesium from said body ~~(26)~~ of magnesium; and

a reaction unit ~~(144)~~ for being supplied with a nitrogen gas heated to a predetermined temperature and causing a reaction between at least said magnesium gas or said fine particles of magnesium and said nitrogen gas to produce fine particles ~~(150)~~ of magnesium nitride, said metal holder ~~(30)~~ being mounted on said reaction unit ~~(144)~~.

5. (Currently amended) A fine particle producing apparatus according to claim 4, wherein said reaction unit ~~(144)~~ is

detachably mounted on a mold ~~(142)~~ and held in communication with a cavity ~~(152)~~ defined in said mold ~~(142)~~ for supplying said fine particles ~~(150)~~ of magnesium nitride into said cavity ~~(150)~~.

6. (Currently amended) A fine particle producing apparatus according to claim 4, further comprising:

a fine metal particle producing mechanism ~~(22)~~ mounted on said reaction unit ~~(144)~~ for producing at least said magnesium gas or said fine particles of magnesium; and

a high-temperature gas producing mechanism ~~(24)~~ mounted on said reaction unit ~~(144)~~ for producing said nitrogen gas heated to said predetermined temperature.

7. (Currently amended) A fine particle producing apparatus according to claim 6, wherein said fine metal particle producing mechanism ~~(22)~~ and said high-temperature gas producing mechanism ~~(24)~~ have respective axes inclined to each other by a predetermined angle within an angular range up to 90°.

8. (Currently amended) A casting apparatus comprising:

a mold ~~(38)~~ for supplying a molten metal into a cavity ~~(40)~~ to produce a casting; and

a fine particle producing apparatus ~~(20)~~ directly connected to said mold ~~(38)~~ for introducing fine metal particles

immediately after the fine metal particles are produced,
directly into said cavity ~~(40)~~;

said fine particle producing apparatus ~~(20)~~ comprising:

a metal holder ~~(30)~~ for housing a powdery or elongate
body of metal therein;

a tube ~~(32)~~ mounted on said metal holder ~~(30)~~ for
supplying a gas to said body of metal through a porous member
~~(28a)~~;

a gas flow rate controller ~~(34)~~ for controlling a rate
at which said gas is supplied to said tube ~~(32)~~; and

a gas heating controller ~~(36)~~ connected to said tube
~~(32)~~ for heating said gas supplied to said body of metal to a
predetermined temperature thereby to generate fine metal
particles from said body of metal.

9. (Currently amended) A casting apparatus according to
claim 8, further comprising:

a molten metal check mechanism ~~(42)~~ disposed between said
mold ~~(38)~~ and said fine particle producing apparatus ~~(20)~~, for
preventing said molten metal from flowing back into said fine
particle producing apparatus—~~(20)~~.

10. (Currently amended) A casting apparatus comprising:

a mold ~~(142)~~ for supplying a molten metal into a cavity
~~(152)~~ to produce a casting; and

a fine particle producing apparatus ~~(140)~~ directly connected to said mold ~~(142)~~ for introducing fine metal particles immediately after the fine metal particles are produced, directly into said cavity ~~—(152)~~;

said fine particle producing apparatus ~~(140)~~ comprising:

a metal holder ~~(30)~~ for housing a powdery or elongate body ~~(26)~~ of magnesium therein;

a tube ~~(32)~~ mounted on said metal holder ~~(30)~~ for supplying an inactive gas to said body ~~(26)~~ of magnesium through a porous member ~~(28a)~~;

a gas flow rate controller ~~(34)~~ for controlling a rate at which said inactive gas is supplied to said tube ~~—(32)~~;

a gas heating controller ~~(36)~~ connected to said tube ~~(32)~~ for heating said inactive gas supplied to said body ~~(26)~~ of magnesium to a predetermined temperature to produce at least a magnesium gas or fine particles of magnesium from said body ~~(26)~~ of magnesium; and

a reaction unit ~~(144)~~ for being supplied with a nitrogen gas heated to a predetermined temperature and causing a reaction between at least said magnesium gas or said fine particles of magnesium and said nitrogen gas to produce fine particles ~~(150)~~ of magnesium nitride, said metal holder ~~(30)~~ being mounted on said reaction unit ~~—(144)~~.

11. (Currently amended) A casting apparatus according to

claim 10, further comprising:

a molten metal check mechanism ~~(42)~~ disposed between said mold ~~(142)~~ and said reaction unit ~~(144)~~, for preventing said molten metal from flowing back into said reaction unit ~~(144)~~.

12. (Currently amended) A casting apparatus comprising:

a mold ~~(38)~~ for supplying a molten metal into a cavity ~~(40)~~ to produce a casting;

a fine particle producing mechanism ~~(22)~~ directly connected to said mold ~~(38)~~ for introducing fine metal particles immediately after the fine metal particles are produced, directly into said cavity ~~(40)~~; and

a reactive gas supply mechanism ~~(24)~~ directly connected to said mold ~~(38)~~ at a position different from said fine particle producing mechanism ~~(22)~~, for supplying said cavity ~~(40)~~ with a reactive gas for reacting with said fine metal particles to produce an active substance which is more active with respect to oxygen than said molten metal.

13. (Original) A casting apparatus according to claim 12, wherein said molten metal comprises molten aluminum, said fine metal particles comprise fine particles of magnesium, said reactive gas comprises a nitrogen gas, and said active substance comprises magnesium nitride.

14. (Currently amended) A casting apparatus comprising:
a mold ~~(142)~~ for supplying a molten metal into a cavity ~~(152)~~ to produce a casting;
a fine particle producing mechanism ~~(22)~~ for producing fine metal particles;
a reactive gas supply mechanism ~~(24)~~ for supplying a reactive gas for reacting with said fine metal particles to produce an active substance which is more active with respect to oxygen than said molten metal; and
a reaction unit ~~(144)~~ directly connected to said mold ~~(142)~~ for causing a reaction between said fine metal particles and said reactive gas to produce said active substance and immediately thereafter introducing said active substance directly into said cavity~~(152)~~, said fine particle producing mechanism ~~(22)~~ and said reactive gas supply mechanism ~~(24)~~ being coupled to said reaction unit ~~(144)~~.

15. (Original) A casting apparatus according to claim 14, wherein said molten metal comprises molten aluminum, said fine metal particles comprise fine particles of magnesium, said reactive gas comprises a nitrogen gas, and said active substance comprises magnesium nitride.

16. (Currently amended) A casting apparatus comprising:
a mold ~~(38)~~ for supplying a molten metal into a cavity ~~(40)~~

to produce a casting; and

an active substance producing mechanism ~~(100)~~ directly connected to said mold ~~(38)~~ for producing an active substance which is more active with respect to oxygen than said molten metal and immediately thereafter introducing said active substance directly into said cavity ~~(40)~~.

17. (Original) A casting apparatus according to claim 16, wherein said molten metal comprises molten aluminum, and said active substance comprises at least either one of magnesium nitride and fine particles of magnesium.

18. (Currently amended) A method of pouring a molten metal into a cavity ~~(40)~~ in a mold ~~(38)~~ to produce a casting, comprising the steps of:

supplying a heated gas to a metal which is more active with respect to oxygen than said molten metal, thereby to produce a feed material ~~(110)~~ containing at least a metal gas or fine metal particles;

supplying said feed material ~~(110)~~ to said cavity ~~(40)~~ to cause said feed material ~~(110)~~ to be oxidized to develop a low-oxygen environment in said cavity ~~(40)~~, and causing at least said metal gas or said fine metal particles to float in said cavity ~~(40)~~—and be deposited on an inner wall surface of said cavity ~~(40)~~; and

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pouring said molten metal into said cavity ~~(40)~~.